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Infant stimulation as a means of obtaining optimum learning for children with delayed development

Sharon Lee Reuter

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INFANT STIMULATION AS A MEANS OF OBTAINING
OPTIMUM LEARNING FOR CHILDREN WITH
DELAYED DEVELOPMENT

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by
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CHAPTER I

INFANT STIMULATION AS A MEANS OF OBTAINING OPTIMUM LEARNING FOR CHILDREN WITH DELAYED DEVELOPMENT

An Introduction

Infancy. In Mussen, Conger, and Kagan's textbook of child psychology, infancy has been defined as the period of life within which the human organism develops from a being struggling to establish an equilibrium outside of the womb, to a personality with an ability to mobilize; with an ability to understand language; and with an ever-increasing capacity to express himself through the use of language.¹ Infancy is a period of rapid physical growth, of refining sensory-motor development, and of emotional stabilities and/or instabilities. Cognitive growth also has its own timetable for development, which is partially dependent upon the interactions of the organism's systems with each other and with the environment. Within early cognition, the infant progresses from a stage of reflexes and complete egocentrism² to a stage where the child manages to solve problems which demand new and unfamiliar means.³ The amount of growth and specialization occurring can not be overemphasized--and neither can the interactions between the

¹Paul Mussen, John Haneway Conger, and Jerome Kagan, Child Development and Personality(New York: Harper and Row, Publishers, 1969), pp. 156 - 157.

²John H. Flavell, The Developmental Psychology of Jean Piaget (New York: Van Nostrand Reinhold Company, 1963), p. 91.

³Ibid., p. 117.

physiological, psychological, environmental, and cognitive realms. What the phenomenon of human life involves, is that all of this interaction intertwines at an appropriate time and at an appropriate rate, all within approximately the first eighteen months of life. This resultant being is then labeled normal and proceeds into the world of the toddler.

Infant Stimulation. Infant stimulation, within the context of a maturing infant who is actively involved with his world, is the environment itself. "Stimulation" does not of itself indicate the degree, the appropriateness, or the quality of interaction needed by the infant. "Stimulation" simply indicates that interaction has occurred between the infant and his life-circle with the child reacting to it in some way. Indeed, it is the premise of western culture "that the average set of parents in an average setting will provide an adequate level of stimulation in the usual course of daily living to insure the development of motor, perceptual, and language skills"⁴ of average children.

Optimum Learning. When optimum learning becomes the goal of infant stimulation, the situation obviously changes. Effective stimulation cannot take place without systematic observation of all dimensions of the child's life. Optimum learning can only occur when one takes into account at least five factors which may influence the effect a stimulus will have upon an infant.

Of prime importance are the innate characteristics which the infant brings with him.⁵ Is the child perceptually sensitive or is he not?

⁴Ray H. Barsch, "Infant Curriculum: A Concept for Tomorrow," Exceptional Infant: Vol. I, ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 547.

⁵Sally Provence, "Some Determinants of Relevance of Stimuli in an Infant's Development," Exceptional Infant: Vol. I, ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), pp. 446-447.

Is his autonomic nervous system a very labile one or a more stable one? Is the infant active or inactive? Each infant has already had nine months of interaction between intrauterine environment and his genetic endowment, bringing further variation and human uniqueness to an already heterogeneous species.

Secondly, there appear to be specific formal characteristics of the stimulating conditions.⁶ A stimulus can be either complex or simple in pattern. It also has a duration and an intensity.⁷ Likewise, in any given situation, there is the factor of multiplicity of stimuli present.⁸ Is the purpose of an experiment to isolate and describe one specific stimulus or is it the description of many stimuli upon an infant?

Complexity, intensity, duration, and multiplicity of stimuli cannot remain constant throughout an infant's life and always reveal the same results. It is only when one looks at the child's total development in every sphere that one can realize the effectiveness or lack of effectiveness of any one stimulating condition.⁹ An example of this would be of the verbal stimulation of the sounds "ma-ma". A two-day-old infant and a twelve-month-old infant would react very differently to such stimulation.

The fourth and fifth factors revolve around the context within which the stimulation occurs.¹⁰ Immediate contextual situations involve the emotional and physiological states which immediately preceded the stimulating situation, and the immediate states which the examiner observes the infant to be exhibiting. Was the child crying or sleeping

⁶Ibid., p. 447.

⁷B. Gray and J. Miller, "Early Experiences in Relation to Cognitive Development," Review of Educational Research in Growth Development and Learning, XXXVII (December, 1967), pp. 475 - 493.

⁸Provence, "Determinants of Relevance," p. 447.

⁹Ibid., pp. 449 - 450

¹⁰Ibid., p. 448.

before the contact, or is he crying now? Was he just fed? Was he scolded? Each of these instances would have their effect on the performance of the child at any given time.

Each child also brings a history of past experiences and memories related to the current stimulus situation. If the new stimulus situation is extremely discrepant from past experiences, it will have a very different effect when contrasted to the results of a stimulus situation where the past and present are closely related. Where the former may interfere with the new learning process, the later may facilitate it.

Delayed Development. As seen above, there are at least five factors which are involved with how the stimulus and the stimulated relate. If one looks closely at the five areas, however, one will also find insights necessary to the understanding of delayed development.

One of the main causes of retarded development appears to be within the genetic and chromosomal area. At conception, life has endowed a being with numerous developmental potentials.¹¹ Societies label these potentials as normal or abnormal, depending upon their own standards of efficiency. Within a normal distribution curve, there most assuredly remains a certain percentage at the far left end of the curve, which is labeled as severely delayed, unusual, exceptional, god-sent, etc.

Another class of causal factors occurs as a result of nutritional, sensory, perceptual, or motoric deprivation. Casler, Goldfarb, O'Connor, Read, Spitz, and White all attest to the deleterious consequences of

¹¹Paul Amos Moody, Genetics of Man (New York: Norton and Co., Inc., 1964), p.

extreme deprivations.¹²

This is an extremely cursory look at causal factors. However, one ought never forget that there are individual potentials manifesting themselves at levels which are unacceptable to certain societies. It is also relevant to remember that environmental conditions can and do alter the performance of infants and children.

In stimulating infants in an attempt to help them come closer to their true "potentials," it is necessary to understand the development of the normal infant and how individual infants deviate from the norm. One must examine the rate at which they develop and master the skills necessary for further learning.

Delayed infants may be described as infants who proceed through the same stages of development as "normal" infants, but do so at their own unique rate.¹³ This rate may be much slower than the "average" upon which the developmental norms are based.

¹² Lawrence Casler, "Perceptual Deprivation in Institutional Settings," in Early Experience and Behavior, ed. by Grant Newton and Seymour Levine, (Springfield, Ill.: Charles C. Thomas, Pub., 1968), pp. 573 - 626; William Goldfarb, "Effects of Psychological Deprivation in Infancy and Subsequent Stimulation," American Journal of Psychiatry, CII (July, 1945), pp. 13 - 33; Neil O'Connor, "Children in Restricted Environments," in Early Experiences and Behavior, ed. by Newton and Levine, pp. 530 - 372; Merrill S. Read, "Malnutrition and Mental Retardation," Journal of Nutrition Education, II (1970), p. 23; R. A. Spitz, "Hospitalism: An Inquiry Into the Genesis of Psychiatric Conditions in Early Childhood," Psychoanalytic Study of Children, I (1945), pp. 53 - 74; Burton White, "Informal Education During the First Months of Life," Early Education, ed. by R. D. Hess and R. M. Bear, (Chicago: Aldine Publishing Co., 1968, pp. 592 - 607.

¹³ Louise B. Ames, "Predictive Value of Infant Behavior Examinations," Exceptional Infant: Vol. I, ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), pp. 207 - 240.

Infants may not have a generalized delay, but rather, they might be delayed in one specific area of development, such as in mastering auditory-perceptual skills.¹⁴ This makes it very important to look at less obvious signs of development. When it is felt that "the child is a little slow, but will catch up," it is important to find out where the child is in his sensory awarenesses and perceptions, and how his attention, memory, thinking, and imagination skills are developing. It is often observed that the child may be developing normally in motor areas and speech areas, with areas of obvious delay still being found.¹⁵

Summary. Stimulation, therefore, becomes an exciting and challenging field for special educators to pursue. Not only does one have infants who are delayed because of reduced developmental potential, but one also has infants whose sensory systems in one or more areas are not benefiting from the normal amounts of stimulation received in the home. Thompson and Grusec say that, depending on how the genotype is constituted, an early experience may have a large effect or no effect at all.¹⁶ It has also been suggested that deprivation, which retards development, can later be compensated for by massive stimulation procedures.¹⁷ This information brings one to an exciting possibility.

¹⁴Ibid., p. 210.

¹⁵Ibid., p. 230.

¹⁶William R. Thompson and Joan E. Grusec, "Genotype and Early Experience," Carmichael's Manual of Child Psychology, Vol. I, ed. by Paul H. Mussen (New York: John Wiley & Sons, Inc., 1970), p. 624.

¹⁷Lawrence Casler, "The effects of Extra Tactile Stimulation On a Group of Institutionalized Infants," Genetic Psychology Monographs, LXXI (February, 1965), pp. 137 - 175.

Perhaps it shall be infant stimulation, when adapted to each child's needs in terms of quality and quantity for a given developmental phase, that will start the delayed infant on the long journey toward social adaptability in adulthood. It may be the way to a new future and new hope for children as yet unborn.

CHAPTER II

A REVIEW OF RESEARCH

For man's knowledge of the infant and his stimulation to be minimally adequate, it would be necessary for researchers to have an in depth knowledge of: (1) the developmental patterns unfolding in infancy; (2) the specific developmental patterns and their unique characteristics which unfold in each of the areas in exceptional infants; (3) accurate measuring devises to determine empirically the behavior of an infant before, during, and after stimulation procedures have been used; (4) the consequences of varying environmental conditions, on a short-term and on a long-term basis for normal and exceptional infants; (5) the effects of varying stimulating conditions at each developmental stage on a short-term and on a permanent basis; and (6) the most economically feasible programs, in terms of personnel, equipment, and methods. At this point in time, our knowledge of infants resembles an ice berg which has broken up into many smaller islands of ice upon floating into a warm body of water. Many isolated areas of infancy are being researched, but there appears to be little relatedness or communication occurring between and within the areas of research.

Within this chapter, the main concentration shall be on research done on the fifth area listed above. The rationale for concentrating on this area is that: (1) there is a vast body of research available in the literature regarding developmental patterns in the normal infant; (2) there has been such limited research done relating to the developmental patterns of exceptional infants that a review would ~~not~~ be possible; (3) there is a growing effort to establish measuring devises to screen infants, give developmental age scores, and quantify the questionnaires

given to parents; however, there are few measures which can accurately differentiate small increments of progress or isolated areas of development; (4) there is much to be learned, from the research on restricted and varying environments; special educators however are working with the results of these environments and need the information from the fifth area of research in order to bring about effective variations in the environments; (5) research in the area of stimulating conditions has been scattered across disciplines and isolated from each other so that practical applications have been virtually non-existent. It is one of the most talked about and least implemented areas in special education today; and therefore (6) the following chapter shall review programs already in existence in the United States, which offer a framework for the use of stimulation with delayed infants.

In order for the reader to have an adequate spectrum of information, brief resumes are presented on the first four areas of infancy research prior to concentration on the main topic of concern. This is done in order to emphasize the need for total awareness by those interested in infant stimulation.

Normal Development In Infancy

This first area has been well researched and certainly¹⁵ not the main concern here. There are five important volumes on normal infant development which give the interested reader a good foundation in the theories and research emphases current today. Paul Mussen has edited the third edition of Carmichael's Manual of Child Psychology.¹⁸ It contains three chapters of almost four hundred pages on the topic of infancy. It is an excellent review of research which is concise and

¹⁸ Paul H. Mussen, Carmichael's Manual of Child Psychology (New York: John Wiley & Sons, Inc., 1970), pp. 237 - 654.

yet thorough; and analytic in its presentation. Secondly, one could look at Flavell's The Developmental Psychology of Jean Piaget,¹⁹ which is based largely upon the observation of Piaget's own children. It very accurately pinpoints six stages of development which would be of concern for anyone working with infants. Rather than approaching development from a strictly physical or sensory viewpoint, Piaget attempts to expand our knowledge of infant cognitive development.

Having read these two classics in the field of child psychology, one could then consider normal variability within infancy. T. Berry Brazelton²⁰ and Sibylle K. Escalona²¹ have written widely acclaimed books in this area. Brazelton's book has been written with all the expertise of a pediatrician and researcher who has worked for more than twenty years with infants. It is easily read and very valuable to professionals looking for material to recommend to parents and co-workers.

Escalona's volume is far more technical. It is the result of her research in the field of normal variability in infants. It presents her methods and techniques for working with infants, and the varying kinds of comparison which can be researched statistically.

The last volume to be mentioned here is not the least in importance—it is a beginning for those interested in this area of research. Jerome Kagan has recently published a book entitled Change and Continuity In Infancy.²² For anyone doing research in any area of infancy, this volume is extremely important. To those who are not involved in research and program development, but rather work with infants in a child-care capacity, it may not be as relevant.

¹⁹ Flavell, The Developmental Psychology Of Jean Piaget (New York: Van Nostrand Reinhold Company, 1963), pp. 41 - 163.

²⁰ T. Berry Brazelton, Infants and Mothers: Differences in Development (New York: Delacorte Press, 1969).

²¹ Sibylle K. Escalona, The Roots of Individuality (Chicago, Ill.: Aldine Publishing Company, 1968).

²² Jerome Kagan, Change and Continuity in Infancy (New York: John Wiley & Sons, Inc., 1971).

All five resources suggested have extensive bibliographies which are as valuable as the books themselves. The point to be made here is that, in the field of infancy, extensive research has been done and is continuing in how the infant matures and what mechanisms are involved in his development.

Developmental Patterns of Exceptional Infants

In 1947, Arnold Gesell and Catharine Amatruda revised and enlarged a volume of their work entitled Developmental Diagnosis: Normal and Abnormal Child Development.²³ Within this work, they described the actions and reactions of infants from one month to thirty-six months of age. What they then investigated was the possibility that differential diagnosis could be done in early infancy in an attempt to make an accurate and early diagnosis of retardation, endocrine disorders, convulsive disorders, neurological involvements, blindness, deafness, prematurity, and precocity. Behavioral characteristics were found clustered around the varying exceptionalities, and each category of exceptionality had its own timetable for the development of motoric, adaptive, language, and social behavior.

Today this book is twenty-six years old, and it still remains as one of the few published attempts to describe exceptional infants. It appears that now, in the 1970's the work of Gesell and Amatruda is being taken seriously in terms of the need for early identification. Although their vocabulary for labeling infants is not used today and their rationale for early identification is not the same as our's, the fact remains that their observations were accurate and can help us in terms of methods of observation, and in what observable reactions to

²³ Arnold Gesell and Catherine S. Amatruda, Developmental Diagnosis: Normal and Abnormal Child Development (New York; Harper & Row, Pub., 1947).

stimuli can be used diagnostically.

What is needed, in terms of behavioral descriptions of exceptional infants, is the clinical analysis of how each infant reacts in his own unique way to the stimuli presented to him at each developmental stage. Compilation of these kinds of data from a varied population of infants would make it possible to delineate the responses for each category of stimuli. An example would be reactions to visual stimuli. An entire continuum of reactions to a visual stimulus could be established. Hypo- and hyper- sensitive reactions at any given developmental stage could then be modified. Stimulation procedures incorporating specific objectives and ultimate behavioral goals could then be experimented with.

The developmental patterns characteristic of differing populations of infants will hopefully be researched, and evaluated in terms of early intervention procedures, rather than in terms of mere categorization of those populations.

Assessment Needs In Programming For The Stimulation of Infants

Assessment needs in infancy are not unlike the assessment needs of any program which works with a population of children. Mass screening should occur which would then produce a list of suspected infants. Entering evaluations of prospective clients would then be done. These evaluations delve deeper into past experience, present functioning, and implied potentials. They are used to say either "yes, we can help this infant," "no, the problem should be handled somewhere else," or "no, there appears to be no problem which we can detect." If the first reply is made, one delves deeper into the specifics of the problem, in an attempt to carefully assess the area being concentrated on in order to formulate a plan for bringing the individual to the ultimate goal one wishes to achieve. Then further testing continues in terms of day-to-day progress, within major developmental stages. The final area of testing occurs in order to assess how the infant or young child leaves one's

institution and thrives in his environment in the years that followed.

This is, of course, the ideal. In actuality, there are screening devices, there are developmental tests, and in a few select ability areas, there are scales of development which assess the growth of the infant in narrow areas of reference (See Appendix A.). However, one must see the existing devices in terms of their purposes and their limitations; and look at the tremendous gaps in the areas assessed. A brief overview of some of the issues raised by the use of these devices is exceedingly valuable at this point.

Predictability and the Development Scales. Nancy Bayley, in a discussion of the Developmental Quotient (D. Q.), has stated that obtaining a D. Q. score is:

...an excellent practice, so long as those who use and interpret the tests are aware of their values and their limitations. In general, tests are of great value in judging and diagnosing a child's current status, but they are of little use in predicting what the child's I. Q. will be a few years later.²⁴

Bayley, then proceeds to explain the nature of intelligence at eight months, thirty months, and at four years of age, in support of the notion that the functions present at each of these ages, which are described as being functions of intelligence, are indeed behaviors which do not develop at a consistent rate in a child. Louise Ames has suggested that in order to establish whether developmental tests are predictive or not, one should correlate the infant's D. Q. with later behavior tests, rather than with I. Q. tests.²⁵ An example of the

²⁴ Nancy Bayley, "Values and Limitations of Infant Testing," *Children*, V (July-August, 1958), p. 129.

²⁵ Louise B. Ames, "Predictive Value of Infant Behavior Examinations," Exceptional Infant: Vol. I, ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 210.

issue both women are concerned about is the relationship between early motor development and later intellectual competence. Bayley states that precocity in sensori-motor development is not a determining factor in whether an older child will be precocious in intellectual functions.²⁶ Further support of this position is found in Knobloch and Pasamanick's article, "Predicting Intellectual Potential in Infancy".²⁷ They state that motor behavior is not predictive of later functioning, but they qualify their statement by indicating that a child's adaptive behavior is predictive. Few, if any, developmental scales have been able to adequately assess adaptive behavior, however.²⁸

Ames gives three primary reasons why tests given during the first year are so unpredictable:²⁹ (1) The language responses which are so highly correlated with what we call I. Q. are not tested on most developmental scales at the early months; (2) Assessment of visual behavior, one of the best single indicators of early superiority, is largely lacking in the tests; (3) Qualitative factors appear to be more indicative of future performance than the quantitative ones. Clinical judgements which bring qualitative aspects of behavior into the overall evaluation are far more accurate than the mere use of developmental tests.

Predictability of Delayed Development. The above section can not go unqualified, however. Nancy Bayley, in concluding her article, has stated that if an infant is found who is below his age norms according to the scales, it is a sign that something is wrong.³⁰

²⁶ Bayley, "Values," p. 130.

²⁷ Hilda Knobloch and Benjamin Pasamanick, "Predicting Intellectual Potential in Infancy," Am J of Diseases of Children, CVI (July, 1963.)

²⁸ Knobloch and Pasamanick, "Predicting," p. 46

²⁹ Ames, "Predictive Value," p. 233.

³⁰ Bayley, "Values," p. 131.

In an experiment done by Illingsworth in 1961, it was found that out of eighty-seven infants he diagnosed as being delayed, sixty-five of them (the experiment excluded clinical types) were later tested and found to have I. Q.'s of under 70 at school age.³¹ Thirty-nine of the infants were diagnosed within the first six months of life; the other forty-eight were found to be delayed before one year of age. His conclusions were: (1) that with repeated examinations, the margin of error is likely to be smaller; (2) with pediatricians giving the developmental scales, the error would be less because of their experiential knowledge of infants and their keen awareness of a child's growth; and finally (3) the fact that the scales may not be predictive for average or above average children does not necessarily negate predictions about below average children. The experiment did not determine how many delayed infants were missed in the evaluations, however. This will require future research.

Knobloch and Pasamanick summarized their findings on the predictability of early testing by stating that it is the physician who has the responsibility of diagnosing the developmental status of the infant. They also held that the main objective of diagnosis should be to identify infants with significant neurological and intellectual defects, and that developmental diagnosis was most important in infancy and in older children with neurologic and pathophysiologic conditions.³²

A related point important in the field of special education is the challenge of sociocultural retardation. When this is the primary etiological factor, early diagnosis is difficult because only after a period of normalcy in early infancy, gradually does a significant delay become apparent.

³¹Illingsworth, R. S., "The Predictive Value of Developmental Tests In The First Year, With Special Reference To The Diagnosis Of Mental Subnormality," J of Child Psych and Psychiat, II (1961), 210.

³²Knobloch and Pasamanick, "Predicting," p. 51.

³³Ibid., p. 51.

Varying Environmental Conditions.

Perhaps the most dramatic findings in infant stimulation were those obtained when institutionalized infants were the target group to be studied. As early as 1939, there were groups of researchers who were describing the deplorable environments found in infant asylums.³⁴ With the emergence of the first Gesell Schedules in 1941, their descriptions became empirically valid testaments of the delay these infants had in their growth.³⁵ Because of this undeniable evidence, researchers then turned to: hypothesizing reasons for the delays;³⁶ experimenting with conditions that could offset these severe delays;³⁷ and determining what the long-range effects of differing environments were, if there were any.³⁸

³⁴ H. M. Skeels and H. A. Dye, "A Study of the Effects of Differential Stimulation in Mentally Retarded Children," Proceedings of the American Association of Mental Deficiency, XLIV (1939), pp. 114-136.

³⁵ William Goldfarb, "Effects of Psychological Deprivation in Infancy and Subsequent Stimulation," American Journal of Psychiatry, CII (July, 1945), pp. 18-33; and R. A. Spitz, "Hospitalism: An Inquiry Into the Genesis of Psychiatric Conditions In Early Childhood," Psychoanalytic Study of Children, I (1945), pp. 53-74.

³⁶ Lawrence Casler, "The Effects of Extra Tactile Stimulation on a Group of Institutionalized Infants," Genetic Psychology Monographs, LXXI (February, 1965) pp. 137-175; Roberta R. Collard, "Exploratory and Play Behaviors of Infants Reared In An Institution and In Lower- and Middle-Class Homes," Child Development, XLII (1971), pp. 1003-1015; Neil O'Connor, "Children In Restricted Environments," Early Experience and Behavior. Ed. by Grant Newton and Seymour Levine (Springfield, Ill.: Charles C. Thomas, Publishers, 1968), pp. 530-572; and R. A. Spitz, "Hospitalism," pp. 53-74.

³⁷ Spitz, "Hospitalism," pp. 53-74; and Goldfarb, "Effects of Psychological," pp. 18-33

³⁸ O'Connor, "Children in Restricted," pp. 530-572.

It was because of this research that special education turned to the theoretical possibility that developmentally delayed children might not have such a severe delay if they were diagnosed and worked with early in infancy. It is, therefore, important to place these findings in the perspective of special education. For a complete review of the literature, one should read two chapters of Early Experience and Behavior, in which Neil O'Connor and Lawrence Casler analyze the research on "Children in Restricted Environments" and "Perceptual deprivation in Institutionalized Settings," respectively.³⁹

The Institution and Etiological Factors. A very real issue in all of special education today is the effect disadvantaged environments have on the learning patterns of otherwise potentially normal children; and of the results of early intervention procedures with this population of children.

In experiments conducted in institutions, gross differences have been found in the short-term effects stimulation is having on delayed infants. Skeels, in 1939, reported an experimental group which gained 28.5 points in I. Q. in comparison with the control group which performed 26.2 points lower on the post-test.⁴⁰ In evaluating the significance of this discrepancy, one must consider the following points: (1) the age at separation from the family and admittance to the institution; (2) the reason for institutionalization; (3) the amount of perceptual deprivation found in the institution; (4) the span of time between the end of the stimulating conditions and the post-test date; and (5) the long-range discrepancies, if there are any,

³⁹ Grant Newton and Seymour Levine. Early Experience and Behavior. (Springfield, Ill.: Charles C. Thomas, Publisher, 1968).

⁴⁰ Skeels and Dye, "A Study," pp. 114-136.

which exist in the primary and intermediate grades.

Remembering that in the 1930's and the 1940's, all unwanted infants were placed in infant asylums, it would have been very interesting to obtain a developmental quotient on an infant upon admittance into an institution and determine whether the infants were institutionalized because they were suspected of being retarded, or whether the factors in the institution had delayed their development. One would find both factors operating, most assuredly. However, it would add to our knowledge of the reasons for such drastic changes occurring in some infants, where changes of such magnitude did not occur in other studies. For example, Goldfarb found that in the institution he was studying, many of the children were placed in foster homes at about thirty-seven months of age.⁴¹ There was a mean Cattell I. Q. difference between the children remaining in the institution and the children placed in foster homes of 28.28 points.⁴² After seven months in the foster homes the difference in mean I. Q.'s was 25.68. The children were older than the infants found in other research studies, a fact which confounds the results with many other intervening variables. The point to be emphasized here is that children whose potential for learning is less, may not make the extreme gains which some of the infants exposed to varying types and degrees of stimulation have made.

Stimulating Procedures in the Research. An extreme oversight in many discussions within the literature has been the description of procedures that were used to stimulate the infants. However, where the information has been given, it appears to be one of "normalizing" the environment in the institution. What this means is that a population of mother-substitutes was found to care for the infants on a one to

⁴¹Goldfarb, "Effects of Psychological," pp. 20-21.

⁴²Goldfarb, "Effects of Psychological," p. 23.

one, or at the most, on a one to three ratio; that toys were provided; that the infant had periods of time to crawl and explore; and/or that even in his crib, he was able to look around and see the world around him.

Collard summarized his findings by stating that three factors were primarily affecting the institutionalized infant:⁴³ (1) the variety of play materials increases the number of schemas in a child's repertoire; (2) familiarity of persons caring for the infant and the nearness of the persons reduces fear; and (3) institutionalized infants are not able to test and explore as other infants do.

Summary. In summarizing this information, one finds that the stimulation in institutions was not specific to the delayed infant who could not profit from ordinary stimulation. It was intended to give the infants a few of the experiences which most infants would have in a family environment.

In the 1970's this picture is changing. No longer are most unwanted infants being sent to institutions. They are placed immediately in foster homes. Now the institutions which are still open are working with infants who are not easily placed in homes—the deformed and the clinical-type infants. The needs at the institutions are now different. It is the need to find stimulating procedures which will help infants who are not profiting from the normal amounts of environmental stimulation.

⁴³ Roberta R. Collard, "Exploratory and Play Behaviors of Infants Reared In An Institution and In Lower- and Middle-Class Homes," Child Development, XLII (1971), 1013.

Research In The Stimulation Of Infants

This review will be presented within the context of developing infants. During the infancy stage of a person's life, many levels of development can be differentiated. Our purpose is to present the research on stimulation and at the same time, place this research in the perspective of the infant's development. One can conveniently break down infancy into four levels of development: the neonatal period, the sensory-affective period, the period of socialization, and a transitional period. At the beginning of each level to be discussed, a brief description of these periods will be presented.

I. The Neonatal Period.

John Paul Scott has described the neonatal period as a critical period because of the importance of nutrition, and the irreversibility of its effects as determined by the amount and type of nutrition the infant receives.⁴⁴ Within this period of adaptation, where an infant stabilizes his internal processes to an atmosphere outside of the womb, many interesting discoveries have been made.

One such discovery is that sensory development is precocious in relation to motor, language, and affective development. It has been found that some response can be elicited by stimulation through all of the major sense organs.⁴⁵ This may suggest how one could begin stimulation procedures during this neonatal period.

Scott, in concluding his discussion of this period, states that human development proceeds at a relatively slow rate. With this extended time for development, much more variability is seen in the human

⁴⁴John Paul Scott, Experience and the Organization of Behavior (Belmont, Cal.: Brooks/Cole Publishing Co., 1968), p. 33.

⁴⁵Ibid., p. 34.

infant. He suggests that much of this early variability found in infants could be the result of how much sensory stimulation is effecting the infant and how the infant is reacting to this kind of stimulation.⁴⁶ Likewise, Bridger and Birns have found that the quality and the intensity of early stimulation can even alter sensory thresholds and general responsiveness.⁴⁷

Autonomic Systems and Their Stimulation. Bridger in 1962 attempted to find psychophysiological phenomena that would distinguish babies at birth.⁴⁸ In using air stream stimulation to the abdomen, acoustic stimulation, and thermal stimulation to the foot, he began to find variations in the reactions of the infants. The greatest response given to these stimuli came from thermal stimulation, with tactile stimulation having the next strongest reactions and auditory stimulation having the least.⁴⁹

However, Bridger cautions that when one is measuring responsiveness to a stimulus, one must consider the prestimulus heart-rate level. He found that as the prestimulus heart-rate level increases, the reactivity to the stimulus decreases.⁵⁰ He therefore believed that an inhibitory-excitatory capacity scale for an infant should be obtained.⁵¹ To do so, he applied the inhibitory stimulus (warm

⁴⁶ Ibid., pp. 37-38.

⁴⁷ Wagner Bridger and Beverly Birns, "Experience and Temperament in Human Neonates, Early Experience and Behavior, ed. by Grant Newton and Seymour Levine (Springfield, Ill.: Charles C. Thomas Publishers, 1968), p. 35.

⁴⁸ Wagner Bridger, "Sensory Discrimination and Autonomic Function In The New Born." Journal of the American Academy of Child Psychiatry, I (1962), p. 67.

⁴⁹ Ibid., p. 70.

⁵⁰ Ibid., p. 69.

⁵¹ Ibid., p. 83.

water) to get the low heart-rate level and the excitatory stimulus (cold water) to get the high heart-rate. The test stimulus (tactile, auditory) was then applied and calculations were done on the range of reactivity for each infant. This data indicated where the stimulation was most effective in terms of the kind of stimulation and the amount of it.

When more than one stimulus was applied, the infant was found to channel his reactions into a soothing response and react less to the over-all activation.⁵² Bridger, therefore, concluded that attention or activity in one modality inhibits or reduces the sensory messages from other stimuli.

The last area of investigation was that of the habituation response to a stimulus. All infants were found to inhibit a marked startle response after one day. Many were found to inhibit any response after the fifth day of stimulation. Bridger cautions against generalizing this finding in terms of sensory discrimination, however. He states that this inhibition is not the same as mature discrimination, but rather that it probably measures basic differences in the neural mechanisms subserving general excitation, inhibition, and specific attention processes.⁵³

Gallin, on the other hand, does not suggest that conditioning and discrimination in this early stage of development are different from the responses found in later infancy and childhood.⁵⁴ It is only within the framework of these primitive neural mechanisms, that one

⁵²Ibid., pp. 79-80.

⁵³Ibid., p. 81.

⁵⁴Eugene S. Gallin, "Research Trends in Infant Learning," Exceptional Infant, Vol. I, ed. by Jerome Hellmuth (New York: Brunner and Mazel, Inc., 1967), pp. 243-266.

should examine two studies reviewed by Gallin, however.

The first study was involved with kinesthetic stimulation patterning.⁵⁵ The unconditioned response was the Babkin reflex. The conditioned response was the movement of the arms from an extended to a flexed position. Patterning was found to occur, significantly, after thirty-five pairings. Caution must be taken in interpreting these results as a suggestion that early conditioning at four days can effect later abilities to learn.

Gallin also cited a study which found infants between one-and-a-half and two-and-a-half days of age being capable of differentially responding to a variety of olfactory stimuli. Inhibition was also found. Again, caution is needed. It is not known whether this kind of a response can be correlated with ability or inability to respond in early childhood or if this type of stimulation can be made usable.

Six years after the appearance of the first article by Bridger, Bridger and Birns qualified and extended many of Bridger's earlier findings. The main point which they wished to present was that "it seems likely that similar environmental changes will have different effects on different babies".⁵⁷ In 1962, Bridger could not interpret the findings which he presented, in terms of applicability in infant care. In 1968, Bridger and Birns stated that "A highly stimulating environment may help activate an extremely placid or unresponsive infant, whereas the same environment may prove to be unnecessarily stressful to a hyperactive, hyper-responsive infant who would thrive in a calmer environment."⁵⁸

⁵⁵Ibid., p. 249.

⁵⁶Ibid., p. 248.

⁵⁷Bridger & Birns, "Experience and Temperament," p. 39.

⁵⁸Bridger & Birns, "Experience and Temperament," p. 100.

The reason for this change was that refinements in measurement instruments and in what was measured, made it possible for Bridger and Birns to test infants and report the following findings:⁵⁹

1. Babies could be differentiated within the first five days of life in terms of their reactivity to external stimuli.
2. Each baby significantly maintained his rank relative to the other neonates (temperament).
3. They tended to maintain their relative rankings in response to all four stimuli: hot and cold thermal stimulation, air stream stimulation, and acoustic stimulation.
4. Individual differences remained consistent during the first few days of life.

Implications from these two studies by Bridger are of great importance to the special educator and the pediatrician. First of all, differences can be determined by an observant pediatrician who is exposed to the procedures necessary for this investigation. Secondly, a method has been found which establishes inter- and intra-individual differences in infants. Thirdly, special educators have been given a possible framework for evaluating their effectiveness using the inhibitory-excitatory capacity scale. Lastly, special educators have been given areas of investigation which they may find useful in the development of specific techniques for stimuli awareness and/or reaction reduction.

Further investigation is now needed in neonatal reactions as they are correlated with developmental competence at six months, a year, and at three years, for instance. It is only through this type of investigation that special educators could bring the knowledge reviewed into an applicable form.

⁵⁹Bridger and Birns, "Experience and Temperament," pp. 88-89.

Soothing Stimulation for the Neonate. The research described thus far has hypothesized and described how individual neonates differ from one another in the degree of reactivity they exhibit to various stimulating conditions. Another area of research which is being done during the neonatal period, is that of finding out the effect of two soothing stimuli--namely, sucking and rocking.

Bridger and Birns have conducted two separate studies in an effort to find out how an infant begins to suck at times other than feeding periods, and of how effective this is in reducing an infant's behavioral response to stimulation.

In the first experiment, the infants were tested fifteen minutes after feeding, and three-and-a-half hours after feeding on a four hour schedule. The procedure was the same at both times. The right foot was placed in six- to eight-degree centigrade water for eight seconds. Two factors were found to influence sucking behavior:⁶⁰ (1) the general level of arousal as measured by the heart-rate; and (2) the history of this arousal. The second factor was further explained as being those specific events occurring prior to and during the experimental procedure. They were (a) the self-stimulating behavior the neonate had already become accustomed to; and (b) the duration of arousal.

Infants at both times, relative to their feeding schedule, remained consistent in their sucking behavior with the onset of the application of ice water. No differential sucking behaviors were found in relation to the amount of time which had elapsed since feeding. Bridger and Birns, therefore concluded that sucking is a learned response, rather than a causal drive itself. The arousal level, its duration, and the infant's past behavior became the stimuli variables effecting the infant's response; thereby indicating the infant's early conditioning abilities.

⁶⁰Ibid., p. 94.

In their second experiment, Bridger and Birns hoped to find out which soothing stimulation was most effective--sucking or rocking. In three conditions infants had ice water applied to the right foot. One group of Infants had no soothing stimulation given at the same time as the ice water was applied. The second group was given at the same time as the ice water was applied. The second group was given a sweetened pacifier and sucking was elicited. In the third group, the experimenter's two hands were applied to the sides of the infant's head, which was rocked gently in an elevated position prior to and during the exposure to the water.

Their findings, in this case, indicated that head rocking was as effective as sucking in diminishing the neonate's behavioral response to the stimulation.⁶¹

Smitherman also did an experiment with rocking, which indicated a further positive effect that rocking may have on the neonate. Infants who were in the experimental group were picked up, wrapped tightly, rocked gently, and then placed back into the crib after six minutes. In the next five minutes, verbal responses were recorded. Analysis showed a difference in the vocal behavior of the control and experimental group of infants, at the .05 level of significance. The infants who had been rocked had more vocal behavior.⁶²

An intervening variable in this study, however, is the swaddling

⁶¹Ibid., p. 96.

⁶²Smitherman, Collen, "The Vocal Behavior of Infants As Related To The Nursing Procedure of Rocking." Nursing Research, XVIII (1969), p. 257.

procedure which accompanied the rocking. In Brackbill's experiments, to be described below, it was found that swaddling was the most effective method of reducing crying in infants.⁶³ It is quite possible that even at the neonatal period of development, it would effect the infant in some way.

The important point to be remembered by special educators would be that the combination of swaddling and rocking can induce a verbal response in neonates.

Summary. Within the neonatal period, stimulation can be used to arouse the infant and to soothe him. The neonate has physiological reactions to varying stimuli which are consistent and can be used to distinguish him from other infants; and he is conditioned to respond to stimuli in such a way as to reduce his arousal level. It is with great humility that man can look upon an infant soon after birth and realize that primitive stimuli-response-feedback mechanisms are already in operation. The neonate is truly an active participant in the world about him.

II. Sensory-Affective Development

Genevieve Carpenter has been most creative in attempting to describe the infant between birth and eight weeks. Her description is one which is based upon how stimulation makes an impression upon an infant, and she hypothesizes that another system may be operating along side sensorimotor development as investigated by Jean Piaget.

⁶³ Brackbill, Yvonne, "Cumulative Effects of Continuous Stimulation on Arousal Level in Infants," Child Development, XLII (1971), p. 22.

She has stated that "except for some of the simpler motor acts such as sucking, blinking, etc., the earliest input-output feedback relationships in the infant appear to be through a sensory-affective system rather than the sensory-motor intelligence."⁶⁴ The reason for her adding this dimension to our theoretical understanding of the infant is that: (1) intelligence and human emotion in childhood and adulthood are never spoken of as being the same system; and (2) the human infant has poorly developed neuromuscular functioning, but precocious perceptual discriminations and expressive reactions.⁶⁵

Carpenter sees the infant as seeking stimulation, as organizing himself around the stimulation, and as having considerable capacity to process the information contained in the stimulus. The sensori-affective development can be remembered by the two choices an infant has at this time:⁶⁶ An infant can become emotional when perceptions exceed the repertoire of actions he has developed; or an infant can resort to mechanisms of self-control. The older an infant becomes, the more an infant can rely on a third choice of adaptation via motor response. This shall be discussed in relation in the later periods of infant development.

Stimulation during this period precedes in the following manner:⁶⁷
 (1) the information input is received and processed: (2) the outcome

⁶⁴Genevieve Carpenter, "A Viewpoint on Early Affective Development," Exceptional Infant: Vol. I. Ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 188.

⁶⁵Ibid., p. 184.

⁶⁶Ibid., 173.

⁶⁷Ibid., p. 185.

of the processing alters the state of the baby; (3) these altered states serve to regulate whether the infant approaches or withdraws the following time, and what type of expressive state will be communicated to the caretaker; (4) subsequent sensory channels are altered because of habituation to a stimulus or the inability to habituate to a stimulus; and (5) via repeated feedback, expressive and affective factors become articulated and organized.

Carpenter describes sensory-affective development in the following manner.⁶⁸ An infant during the neonatal period is found to attend to one input area at a time. At approximately one week of age, there is an increase in the motor activity which accompanies the infant's scanning. Little expressive smiling, cooing, straining, or crying is found. At approximately three weeks, smiling is more frequent and the infant's responses to stimulation become more discriminative. At approximately the fifth or sixth week, the infant's excitatory pattern becomes more specific and articulated. Mouth and head movements decline, and vocalizing and smiling increase. It is at this point that the infant moves into the next period to be discussed.

Stimulating the Senses. Yvonne Brackbill has published one of the most interesting studies done on early infancy. The question which she attempted to answer was whether the level of arousal decreases in an inverse proportion to the number of sensory modalities being continuously stimulated.⁶⁹

Brackbill described fully the procedures which were used in the stimulation of the auditory, visual, proprioceptive-tactile, and thermal

⁶⁸ Ibid., pp. 180-181.

⁶⁹ Brackbill, "Cumulative Effects," p. 17

senses. Since very few studies went into such depth in their descriptions, the interested reader would find it well worth the time to find this specific article.

The results of the experiment did indicate that an increasing number of stimuli produced an increase in the amount of time an infant was sleeping; and decreased (1) the time spent on crying, (2) the heart-rate and respiratory rate, and (3) the motor activity.⁷⁰ Of more importance than these findings were the statistics which showed that the amount of time the infants were awake and quiet did not change as the total stimulation increased, meaning that somnolence did not occur at the expense of quiet-awake time.

The quality of stimulation and its effect on the infants was also pursued.⁷¹ Swaddling was the greatest method of reducing crying and increasing sleeping time. Thermal stimulation also had this effect, but to a lesser degree, and auditory stimulation was found to have an equal effect on the amount of time spent on crying and sleeping. It was interesting to note that the visual stimulus of light had the opposite effect. There was much more time spent on crying and less on sleeping.

Measurements were also taken relevant to the amount of time stimulation had been used. It was found that with the onset of the stimuli there was an orienting reflex which actually increased the arousal level.⁷² Only with prolonged stimulation did the infants become quiet and fall asleep. This same behavior was found with discontinuous stimuli presentations.

⁷⁰Ibid., p. 21.

⁷¹Ibid., p. 23.

⁷²Ibid., p. 24.

There are several important ways in which this information could be utilized. First of all, those continuous and cumulative procedures might be used with colicky, cranky, or ill infants. One need only think of how many infants are brought to hospitals who are battered or suspected of having been hurt by parents who could not cope with the infant's crying any longer. In prenatal courses on infant care or during nurses' informal discussions with mothers who have just had babies, mention of swaddling, warm water, and the use of a quiet radio station may help parents find an alternative reaction before they reach the point where they cannot control their own behavior.

Hospitals and parents who work with premature infants having hyper-tonicity, tremors, or spasms may also find this research of significance.

Stimulating Vision. Gettman and Streff have very appropriately written a pamphlet in which the infant speaks to his parents on how his vision develops.⁷³ Let's eavesdrop for a moment before looking closer at the research.

...You will notice, even in the first weeks of my life, I am attracted to diffuse (scattered) areas of light. I have become aware of light, and by looking at bright spots and shadows, I begin to develop the skills of this very important receiver for information known as vision⁷⁴...It isn't long before I learn there can be different patterns of light (bright objects), and that some of these move. I soon move my eyes and head in an attempt to follow them...I should learn that I can move my eyes without always moving my head.⁷⁵

⁷³G. N. Gettman and J. W. Streff, You Can Help Me Learn To See, pp. 6-7.

⁷⁴Ibid., p. 6.

⁷⁵Ibid., p. 7.

This description is very accurate when one is examining this period of development. It has been found that vision is the last sensory input to develop. Although illumination has been found to have an effect on infants during the neonatal period as Brackbill indicated, attention to colored objects develops slowly.⁷⁶

White, Held, and Castle found in their research that the optimal distance for vision at the sensory-affective period was twenty-four inches and that attention was best elicited by a low attitude, rapid oscillation of the stimulus in the peripheral portion of the visual field.⁷⁷ Visual pursuit consisted of a series of jerky fixations on the stimulus. Because infants have not yet developed flexible accommodative capacities at this age, their focal distance when attending to stimuli between six and sixteen inches appeared to be fixated at about nine inches.⁷⁸ For this reason, the infant has not yet begun even a primitive motion of reaching for an object.

White and Castle found, in another study however, that attending behavior and visual exploration can be induced by rocking.⁷⁹ With a population of infants from a state hospital, they gave the experimental infants twenty minutes of extra rocking daily for thirty days. They discovered that those infants who had been rocked spent a greater proportion of their waking time attending to and exploring their visible environments.

⁷⁶ Brackbill, "Cumulative Effects," p. 23.

⁷⁷ Burton L. White, Richard Held, and Peter Castle, "Observations on the Development of Visually-Directed Reaching," Exceptional Infant, Vol. I, Ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 274.

⁷⁸ Ibid., p.

⁷⁹ Burton L. White and Peter W. Castle, "Visual Exploratory Behavior Following Postnatal Handling of Human Infants," Perceptual Motor Skills, XVIII (1964), P. 498.

This research should indicate that while vision is not totally accurate at this time, the infant still needs materials which are visibly appealing in order to progressively train the eyes. Gettman and Streff suggest a dim night light, so that the infant will always have something to look at when he awakens. This will help the infant learn to point his eyes toward something. Changing the crib occasionally will also make the room visually new to the infant and hold his attention. So will alternating the side from which you change and feed the baby.⁸⁰

Accelerating Early Skills. In the next period, social smiling appears as a natural phenomenon. Earlier, however, a smile response can be conditioned in infants. Gallin cites research which was done in this area.⁸¹

In one such study, a four-week-old infant was conditioned by eye contact and smiling from the experimenter.⁸² When the infant was crying, A's face was neutral. When the infant smiled, E gave the infant the reinforcement mentioned above. The subject's crying duration decreased rapidly during the nine days of reinforcement, crying being totally absent on the last three days. The experimenters concluded that a social response may be conditioned in a life setting according to the operant paradigm in the first months of life.⁸³

⁸⁰ Gettman and Streff, You Can Help Me, pp. 6-7.

⁸¹ Eugene S. Gallin, "Research Trends in Infant Learning," Exceptional Infant, Vol. I, Ed. by Jerome Hallmuth (New York, Brunner/Mazel, Inc., 1967), pp. 254-258.

⁸² Ibid., p. 257.

⁸³ Ibid., p. 258.

J. P. Scott, in his review of the literature, also found studies which indicated the human infant's capacity for rapid, stable conditioning at around five weeks of age. The areas conditioned were head turning and sucking.⁸⁴

The significance of this research is of great concern to those interested in infant stimulation. For infants who are delayed as early as the fourth week of life, conditioning procedures can be experimented with and become instrumental. The problem shall be in devising gimmicks which will bring the first approximate response wanted by the experimenter. This response can then be shaped through reinforcement of successive approximations.⁸⁵ In the study cited by Galin, for instance, a shiny metal saucer was first used to evoke the smiling.⁸⁶

III. Socialization.

The critical period of socialization should be viewed as an extension of the sensory-affective developmental period. It is important to remember that throughout infancy, sensory-affective development is occurring alongside the sensory-motor development. The point of differentiation in periods, however, occurs when the infant's vision becomes sophisticated enough so that he differentiates the features of objects and people. Leon Yarrow had found this to occur in the sixth week with 66% of the infants he examined.⁸⁷

Scott indicates that at about two-and-a-half months, the infant's visual capabilities first appear to be associated with the visual

⁸⁴ Scott, Early Experience, p. 35.

⁸⁵ Gallin, "Research Trends," p. 257.

⁸⁶ 1., p. 257.

⁸⁷ Leon Yarrow, "The Development of Focused Relationships During Infancy," Exceptional Infant: Vol. I, Ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 435.

attention of adults.⁸⁸ Alpha waves on the EEG, which are associated with visual attention, are well-established by the fourth month.

It is to be expected, therefore, that the infant progressively develops social response patterns and motoric responses to various objects. Leon Yarrow has found five types of social responses to animate and inanimate levels of stimuli.⁸⁹ The first response has already been discussed. It was the differential behavior infants exhibit to objects and persons. By three months of age, 81% of the infants exhibit to objects and persons. By three months of age, 81% of the infants exhibited behavior which was specific to the caretaker, and 40% preferred the mother's attentions. Active differentiation of a stranger was found in the fifth month by 71% of the infants. Forty-six per cent of the infants exhibited stranger anxiety at eight months of age. The highest level of object relationship was that of the confidence relationship. This level first appears as behavior indicating the infant's expectation to be soothed in a distress situation. A much more sophisticated form of this involves the infant's capacity to wait for gratification from the mother. Thirty-one per cent of all the infants reached this higher form of confidence by the eighth month of life.⁹⁰

There are very definite implications from this information for curriculum development. Can one place an infant in a structured program before he has established these confidence bonds with a parent? Or should one begin a program with the parent being an active participant in his home? Perhaps the criterion of a confidence bond should be one consideration in judging when the infant should be in a home training program and when he is ready for the structured program of a facility other than the home.

⁸⁸ Scott, Early Experience, P. 38.

⁸⁹ Yarrow, "The Development of Focused Relationships," p. 440.

⁹⁰ Ibid., p. 435.

Vision and the Development of Grasping. The period of socialization is largely dependent upon the infant's visual development, as emphasized in the above paragraphs. Another outgrowth of this development is the motoric response of grasping. Gettman and Streff have the infant describing it like this:

...One of my first ways of finding out what these various signals of light mean to me occurs when I see my hands. I move my hand, and I feel and see the movement. I'm learning about my hand two ways....I see first one hand, then the other. I discover I have two sides--and it isn't much longer until I can bring the two hands together and 'see' them in one 'look,' at the same time, right there in front of me....about now, I'll begin to reach for your face, when you and I have our bedtime 'conversations.' I see your face, and I want to use my hands to check what I'm seeing. As soon as I find out that my hands can help me see, I'll start reaching for many bright or moving things that attract me.⁹¹

Two specific developments in the visual mechanisms are responsible for the infant's attention on objects and the resultant prehensile development.⁹² (1) The development of flexible accommodative functions culminate in virtually adult-like accommodative performance. (2) The initiation and complete development of visual convergence occurs by the end of the socialization period. Given these two developments, the infant will begin the long process of acquiring grasping skills--that is, if he is given something interesting to look at, something he would want.

White, Held, and Castle, whose main study was of prehension, did several months of pilot work on finding which stimulus produced the greatest number of responses in tests. In concluding the pilot research they selected a printed, multicolored paper party toy as the

⁹¹Gettman and Streff, You Can Help Me, pp. 8-11.

⁹²Burton L. White and Richard Held, "Plasticity of Sensorimotor Development in the Human Infant," Exceptional Infant: Vol. 1. Ed. by Jerome Hellmuth (New York: Brunner/Mazel, Inc., 1967), p. 310.

stimulus object.⁹³ They attributed the infant's fascination to this object as being a function of its: (1) complex field and (2) highly contrasting hues.

Another variable which was associated with the onset of sustained hand reaching was the number of alternative visual objects that were present in the infant's environment. It was found that infants having few objects to view at one time began sustained hand viewing at about two months. Those who had a wide variety of objects to look at failed to exhibit sustained hand regard until three months of age.⁹⁴ White, Held, and Castle then found that "once sustained hand regard appears, swiping at the test object inevitably follows within a few days."⁹⁵

This discussion leads one to pedagogical concern about materials one would want to utilize at this time; and of the goals one would wish to establish when an infant is at this developmental period.

Consideration of the complexity with which an object hits the eye and the use of colors is of prime importance. Novelty of the stimulus is also a factor; but on the other hand, limitation of stimuli on which to focus is also a prime factor. A variety of objects is needed which can be presented one or two at a time, having the visual appeal complex contour and color.

The goal of this period is that the infant attain what White, Held, and Castle call top level reaching.⁹⁶ The objectives which one establishes in attaining this goal are ten-fold. The entire organizational framework is based on the ten developmental stages required.

⁹³White, Held, and Castle, "Observation on the Development," p. 272.

⁹⁴Ibid., p. 286.

⁹⁵Ibid., p. 286.

⁹⁶Ibid., p. 281.

White, Held, and Castle differentiated these ten stages as:⁹⁷

(1) The first stage of development was defined as the infant swiping at an object. One hundred per cent of all infants established the groundwork for development in this way. (2) Secondly, the infant was found to unilaterally raise a hand. Again, 100% of all infants portrayed this behavior. (3) Sixteen out of eighteen infants then raised both hands. (4) Eighteen out of nineteen infants, began alternating their glances between the hand and the object. (5) Then 100% of the infants brought their hands to their midline and clasped their hands together. (6) With less frequency, eleven out of nineteen infants raised one hand while alternating glances; the other hand was at the midline clutching at an outer garment. (7) Greater consistency was found in the behavior to orient the torso toward the object. This was found in fifteen of eighteen infants. (8) Fourteen of the nineteen infants brought their hands to the midline, clasped them, and oriented them towards the object. The Piaget type reach was found in twelve of the eighteen infants during the ninth stage. One hand is raised, looked at, and brought slowly to the stimulus while the infant repeatedly shifts his glance between the two. The hand eventually hits the object, fumbles, and crudely grasps.⁹⁸ (10) Finally the goal is reached. As the hand reaches for the object, it anticipates contact. One hundred per cent of the infants achieved this goal.

Differentiation of Auditory Stimuli. It has been found that the infant has very acute auditory abilities as early as one month of age. Eimas,

⁹⁷Ibid., p. 282.

⁹⁸Ibid., p. 280.

⁹⁹Ibid., p. 281.

et. al., described the results of their study with one-month-old infants.¹⁰⁰ They found that not only were the infants responsive to speech sounds and able to make fine discriminations; but they were also perceiving speech sounds along a continuum which approximated the categorical perception which adults have in perceiving the same sounds. The infants, therefore, are able to sort acoustic variations of phonemes with relatively little exposure in production.¹⁰¹

Gallin indicates that although this is true during the first two months of life, an infant can not easily be conditioned to respond to varying acoustic signals with differentiated motoric movements.¹⁰² He cites research which indicates that not until the eleventh week do the response patterns become specific and appropriate. Gallin attributes this to the global motoric maturation lag which has been suggested throughout this paper.

What this suggests to the reader is that infants are able to refine their auditory skills, are learning about voice qualities, and are beginning to match voice and tactile patterns. All of this learning can take place before the infant can motorically approach or withdraw with his whole body toward or away from another human being. There is one response which does indicate the infant's stimulation and contentment levels--the infant's own vocalizations.

¹⁰⁰ Peter K. Eimas, Einar R. Siqueland, Peter Jusezyk, and James Vigorito, "Speech Perception In Infants," Science, CLXXI (January 22, 1971), p. 303.

¹⁰¹ Ibid., p. 305.

¹⁰² Gallin, "Research Trends," p. 245.

Paul Weisberg conducted a study with three-month-old infants to find out if an adult could serve as a discriminative stimulus for vocal behavior.¹⁰³ Six conditions were explored: no examiner present; an examiner present, but giving no responses at all; noncontingent social stimulation; noncontingent nonsocial stimulation (door chime sounded on a set schedule); contingent social stimulation; and contingent nonsocial stimulation. Weisberg found that (1) all subjects showed a gain in their vocal rates; (2) those in the group in which contingent social stimulation was used, made considerable gains which resisted extinction; (3) the unresponding adult was not any more valuable than having no adult at all in the room; and (4) conditions other than social stimulation did not seem to control infant behavior.¹⁰⁴

Here one sees a dramatic experiment which brings one to consider two points regarding social response to an infant. First of all, it appears that the infant's behavioral response, when considering the sensory-affective development of the infant, is to vocalize. Vocalization has been shown to develop through social stimulation. Secondly, one can look at the development of speech, itself, and link the cooing of the infant with the long process of developing the speech mechanisms. Practice of cooing can be invoked by social stimulation.

Therefore, the mechanisms for speech and the affective factors which produce speech both can be established through social stimulation. It is the research of the future which may add to our knowledge of the silent child.

¹⁰³Paul Weisberg, "Social and Nonsocial Conditioning of Infant Vocalizations," Child Development (November, 1963), p. 377.

¹⁰⁴id., p. 385.

The Transitional Period. The transitional period of infancy is marked by the infant's preparation to enter the toddler years. John Paul Scott has placed this preparation on three levels: motoric development, adaptive development, and verbal development.¹⁰⁵ Motorically, the child progresses through the stages of crawling and creeping to the point where he begins to take those first steps. Adaptively, the infant begins to eat as adults do. He also starts to unfold the sensorimotor intellectual development which Piaget speaks of. Verbally, the first words become meaningful.

As is the case with all transitional periods, it is difficult to find research on how these three levels may be altered through stimulation procedures. Two studies in this area are Geber's study on the psychomotor precociousness of African children and Rheingold's study on stimulation levels. Both of these will be discussed below.

Psychomotor Precociousness in African Children. In the country of Uganda, Geber found extreme precociousness in the psychomotor area.¹⁰⁶ At each level of development, Uganda infants and children were two to three months ahead of the average development of European infants at that same age.

Geber attributes this to the massive amounts of stimulation which all infants receive from the time of their birth. The Ugandan infant is never left alone by his mother. He is carried on her back, often with skin-to-skin contact wherever she goes. He sleeps with her, is fed upon demand, and is stimulated by her various activities around the home. He hears all of her conversations and is, in essence, the subject of her warmth and loving affection.

¹⁰⁵ Scott, "Early Experience," p.

¹⁰⁶ E. Geber, "The Psychomotor Development of African Children In The First Year and the Influence of Maternal Behavior," Journal of Social Psychology, XLVII (1953), p. 135.

It can be seen that even with the knowledge that psychomotor development can proceed at a faster pace, the requirements which are necessary for this to take place are unfeasable in the American culture. Further investigation of the various components which have been described as a way of life may help educators to learn which factors are of prime importance.

Maintaining Positive Behavior of Infants. Rheingold and Samuels did their research with infants who were known to be fussers, and tried to identify the reason for their fussing and the stimuli which would stop such behavior. They postulated that fussing was the human infant's response to the aversive properties of diminished sensory stimulation. Normal behavior disintegrates when the general sensory input falls either in amount or patterning below a certain level.¹⁰⁷

The results indicated that fatigue should not be invoked as the cause of the fussing. Subjects who were being tested and were fussing were not inactive. It appeared that the infants were not tired, but rather that they were tired of their environment.

The authors then indicated three factors involved with an infant's interest in the toys around him: (1) novelty; (2) a changing environment; and (3) the number of sensory feedback areas being utilized.

¹⁰⁷Harriet L. Rheingold & Helen R. Samuels, "Maintaining the Positive Behavior of Infants by Increased Stimulation," Annual Progress in Child Psychiatry and Child Development, (1970), p. 2.

CHAPTER IV

ADMINISTRATIVE CONSIDERATIONS

There are inadequacies and gaps in the published infancy research which is available at this time. Secondly, continual changes will have to be made in the goals, objectives, methods, materials, and engineered environments as the findings of vast amounts of research now being carried on become available to those interested in infant development. If one can accept these two conditions, one can develop a flexible framework in which to work with infants.

However, there are still many problems which the administrators, directors, and specialists must consider as a staff before undertaking such a project.

Bettye Caldwell, for instance, advocates careful program description. One factor included is the infant population, itself. One need not describe one specific and narrow population. That is not being suggested here. However, one should describe the major emphases which will be stressed, what qualifications the staff has, and the framework of interaction with the infant. Simply knowing that one agency is a day-care, full-day program whose purpose is to enrich the infant's environment, while another is an outpatient program with extra-environmental stimulation procedures, should help a referring agency decide which may be more appropriate for the individual infant. Staff members

Bettye Caldwell, "The Rationale for Early Intervention," Exceptional Children, XXXVI (Summer, 1970), p. 725.

who are predominantly trained speech therapists, qualified nurses, or experienced special educators, will describe the infants they are most able to work with. Knowing the amount of time which the infant development specialists are spending in the homes, and the responsibilities which the program places back on the home environment, will also specify an infant.

If one is able to obtain a certain population of infants, consideration of at least nine more areas of program description is suggested by George Shepard:

- (1) The techniques and procedures for early identification which will be used with the infants one will be servicing
- (2) The appraisal instruments
- (3) Programming techniques to meet the individual needs of an infant
- (4) Facilities
- (5) Staff ratios
- (6) Specific materials and equipment
- (7) Evaluation of progress
- (8) Labeling
- (9) Public School obligations

Many of these points will not be worked out at the onset of the program. However, programs which are working with infants have an obligation and a responsibility in developing those which are not developed at the onset of the program.

More theoretical, perhaps, is the need for all community services to be cooperative in working for the benefit of each young child. R. R. Rembolt advocates an interdisciplinary approach. He describes this

George Shepard, "The Early Education of Handicapped Children," Focus on Exception Children, III (March, 1971), p. 9.

R. R. Rembolt, "Programming for Infants With Cerebral Dysfunction: An Overview," Interdisciplinary Programming for Infants With Known or Suspected Cerebral Dysfunction. Ed. by Gene Hensley and Virginia Patterson. (Boulder, Colorado: Western Interstate Commission for Higher Education, 1970.), p. 4.

approach as operative if three groupings are effectively established:

- (1) When grouping of professional workers occurs "in order to achieve satisfactory diagnosis, assessment, and management."
- (2) When grouping of children is arranged "to facilitate their care and treatment."
- (3) When grouping of the "parents of the children" takes place in order to facilitate their interactions with their entire family and optimize the learning of all.

Wisely, he places this ideal into the realm of practicality. All professionals must admire the perception of Rembolt when he states that it is only with reservation that a child is not swamped by over-enthusiastic professionals who could over-stimulate the child so that he would turn off all stimulation coming to him. At the other extreme of interaction with the child, he also cautions that too much inter-professional communication can accomplish less constructive work with the child. Therefore, in a new field, where ample planning time, team teaching evaluation periods, parent involvement, and research obligations to the field are important, new systems are needed to make these obligations efficiently constructive in terms of time, less the "infancy advocates" are pulled away from actually working with the infants.

This paper has attempted to review what infant stimulation procedures might be used with the delayed infant. It has suggested curriculum ideas which have been used in the United States up until this year, and has suggested areas where future research would bring infant curricula to an even greater level of excellence.

It is only with the cooperation and the support of the administrators of schools already existing for exceptional children, however, that infancy programs will continue to grow and bring higher levels of competency to the exceptional children of tomorrow.

Ibid., p. 4.

Ibid., p. 5.

APPENDIX A

Developmental tests and preschool intelligence tests

Bayley Scales of Infant Development by Nancy Bayley
The Psychological Corporation
304 East 45th Street
New York, N. Y. 10017

California Developmental Charts

Cattell Infant Intelligence Scale by Psyche Cattell
The Psychological Corporation
304 East 45th Street
New York, N. Y. 10017

Denver Developmental Screening Test William Frankenburg
LADOCA Project and Publishing Josiah Dodds
Foundation, Inc.
East 51st Ave. and Lincoln Street
Denver, Colorado 80216

A Developmental Screening Inventory Hilda Knobloch, Benjamin
Hilda Knobloch Pasamanick, and Earl S. Sherard
44 Holland Avenue
Albany, N. Y. 12208

Gesell Developmental Schedules Arnold Gesell
The Psychological Corporation
304 East 45th Street
New York, N. Y. 10017

The Griffiths Mental Developmental Scale Ruth Griffiths
Ruth Griffiths
Child Development Research Centre
47 Hollycroft Avenue
London N. W. 3, England

Hetzer-Wolf Baby Scales from the Vienna test

Merrill-Palmer Scale of Mental Tests by Rachel Stutsman
C. H. Stoelting Co.
424 North Homan Avenue
Chicago, Illinois 60624

Minnesota Preschool Scale by Florence Goodenough, Katherine Maurer
Educational Test Bureau M. J. Van Waagen
Division of American Guidance Service, Inc.
720 Washington Ave., S. E.
Minneapolis, Minn. 55414

Revised Yale Developmental Schedules

Stanford-Binet Intelligence Scale Samuel Pinneau, Lewis Terman
Maud Merrill

Houghton-Mifflin Co.
2 Park St.
Boston, Mass. 02107

Language Stimulation Evaluation

The Bzoch-League Receptive - Expressive Emergent Language Scale
for the Measurement of Language Skills In Infancy by Kenneth
Bzoch & Richard League

The Tree of Life Press
P. O. Box 447
Gainesville, Florida 32601

Preschool Language Scale by Irla Lee Zimmerman, Violette G. Steiner
Roberta L. Evatt

Charles E. Merrill Publishing Company
Columbus, Ohio

PPVT by Lloyd M. Dunn

American Guidance Service, Inc.
Publishers' Building
Circle Pines, Minn. 55014

Verbal Language Development Scale by Meril J. Mecham

American Guidance Service, Inc.
Publishers' Building
Circle Pines, Minn. 55014

Pre-speech Feeding Evaluation

Motor Evaluation of the Speech Mechanism by Suzanne Evans Morris

Illinois State Pediatric Institute
1640 West Roosevelt Road
Chicago, Illinois 60608

Physical Therapy Evaluation

First Assessment by Western Cerebral Palsy Center

The Western Cerebral Palsy Center
20 Wellington Road
London N. W. 8, England

Lincoln-Oseretsky Motor Development Scale by William Sloan

Lincoln State School & Colony
361 South State Street
Lincoln, Illinois

Milani-Comparetti by E. A. Gidoni

Centro A. Torrigiani C. R. I.
Via de Camerata 8
Firenze, Italy

Parental Evaluation

Hoopes Infant Rating Scale

Parents' Evaluation of their child's Handicap

Kiwanis Children's Rehabilitation Center
10437 West Watertown Plank Rd.
P. O. Box 7372
Milwaukee, Wisconsin 53226

Parent's Attitude Scale by Mr. E. Gumz

Kiwanis Children's Rehabilitation Center
10437 West Watertown Plank Rd.
P. O. Box 7372
Milwaukee, Wisconsin 53226

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To Talk. New York: CEBCO/Standard Publishing Co.

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Children. Cambridge, Mass.: The MIT Press, 1971.

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